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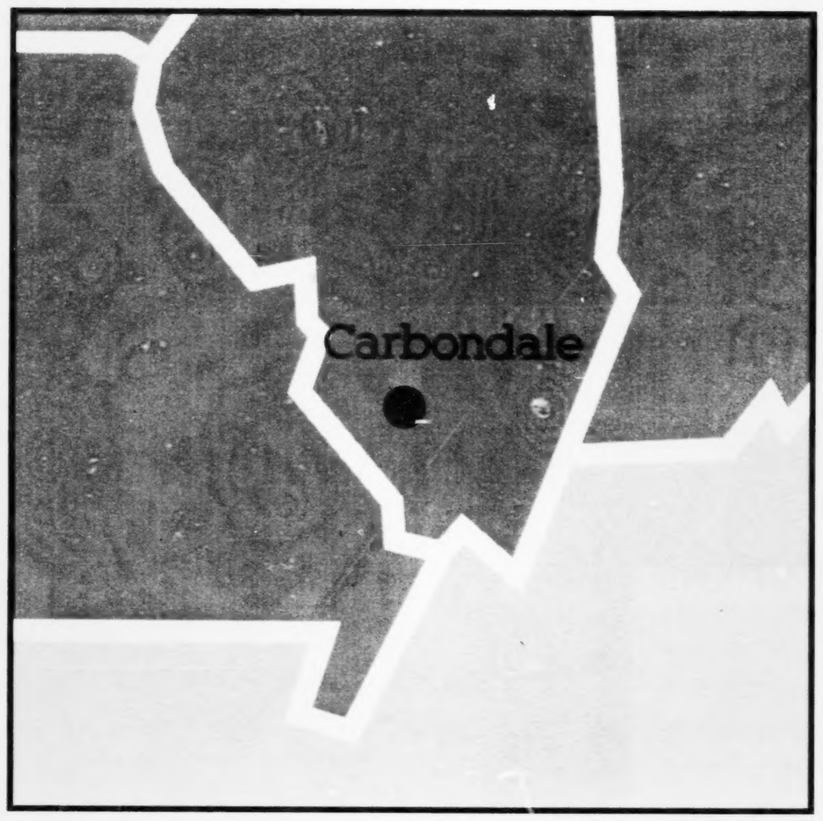
FORESTRY SCIENCES LABORATORY

CARBONDALE, ILLINOIS



NORTH CENTRAL FOREST EXPERIMENT STATION

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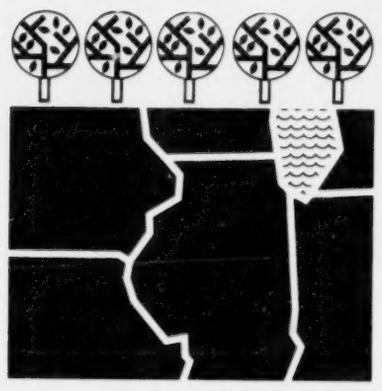
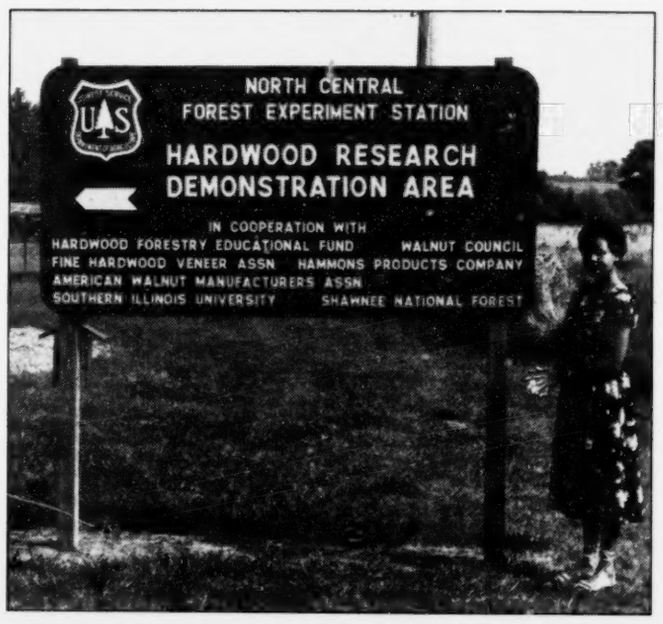
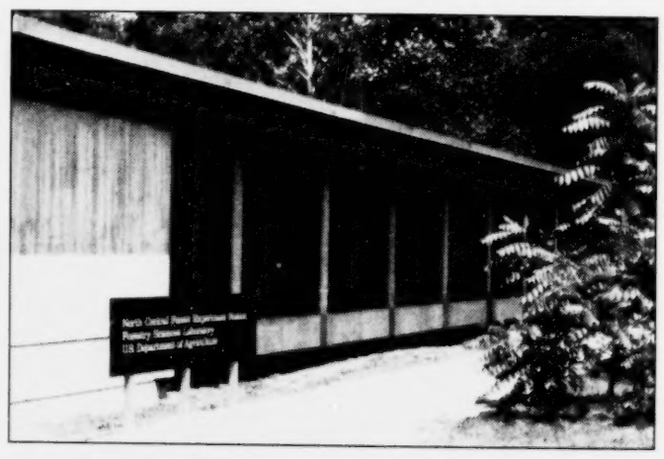
PHYSIOLOGY, GENETICS, AND PROCESSING OF CENTRAL HARDWOODS





The Forestry Sciences Laboratory at Carbondale, Illinois, is one of eight field units of the Forest Service's North Central Forest Experiment Station, headquartered in St. Paul, Minnesota. It is located on the campus of Southern Illinois University-Carbondale, in the heart of the central hardwood forest region. Facilities consist of laboratories, offices, greenhouses, a library, and growth chambers.

The Laboratory staff works on a variety of studies at the Tree Improvement Center, the Wood Processing Pilot Plant, and other units in southern Illinois. Research is also conducted on the Kaskaskia Experimental Forest, the Shawnee National Forest, and the Union County State Tree Nursery. And, our research effort extends well beyond southern Illinois through cooperative agreements and joint studies that include more than 20 states and 3 Canadian provinces. These cooperative efforts involve researchers and cooperators from many universities, various National Forests, the timber industry, state Departments of Natural Resources, the Walnut Council, the Fine Hardwood Veneer Association, the American Walnut Manufacturers Association, and private businesses and landowners.



The Carbondale laboratory has served as a center for central hardwood research since 1946. Originally, the charter of our research program was to improve timber growth and quality and to find new uses for low-grade wood. Now, the research has evolved into more fundamental studies of the physiology, genetics, pathology, and wood properties of high-value central hardwoods.

Here, scientists in all our research projects work under an "umbrella" of interrelated timber management, protection, and utilization research to:

Evaluate the effects of cultural practices and genetics on the physiology, wood properties, and processing characteristics of high-value hardwood trees.

Quantify the genetic and environmental variation for high-value hardwoods to assist in the selection and production of superior seedlings.

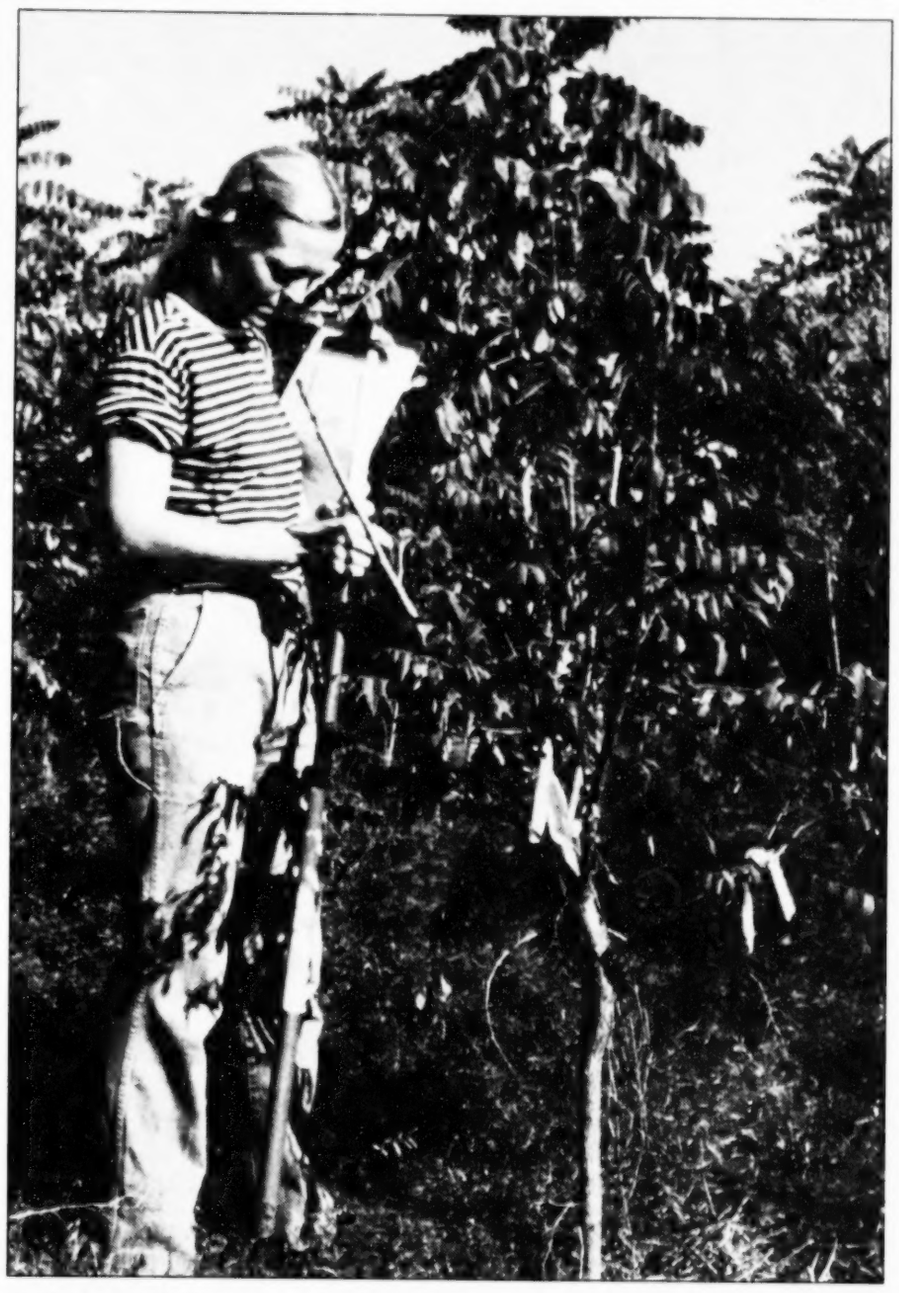
Devise techniques to diminish pest-caused stresses that reduce tree growth and affect wood quality.

Determine the factors that alter the permeability and quality of hardwoods.

Because of the dwindling supply of quality black walnut, white ash, red oak and white oak, strong emphasis was placed on plantation culture during the early history of the Forestry Sciences Laboratory. This emphasis continues as

scientists from several disciplines integrate their knowledge to develop the best cultural practices for efficiently producing high-quality timber on the best sites. We are learning how different ground covers, shrubs, and other trees affect growth and influence the wood properties of trees from both plantations and natural stands.

Visitors can see the effects of various cultural practices on hardwood establishment and early growth at the Hardwood Research Demonstration Area, located at the Tree Improvement Center, about 3 miles west of the Forestry Sciences Laboratory. The demonstration area, which is open to the public year-round for self-guided tours, illustrates the practices we currently recommend for establishing and managing plantings of high-value central hardwoods.

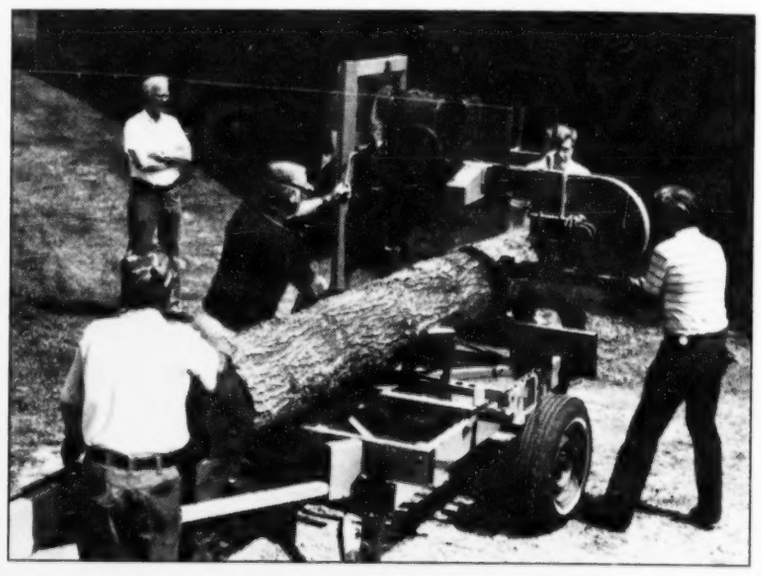


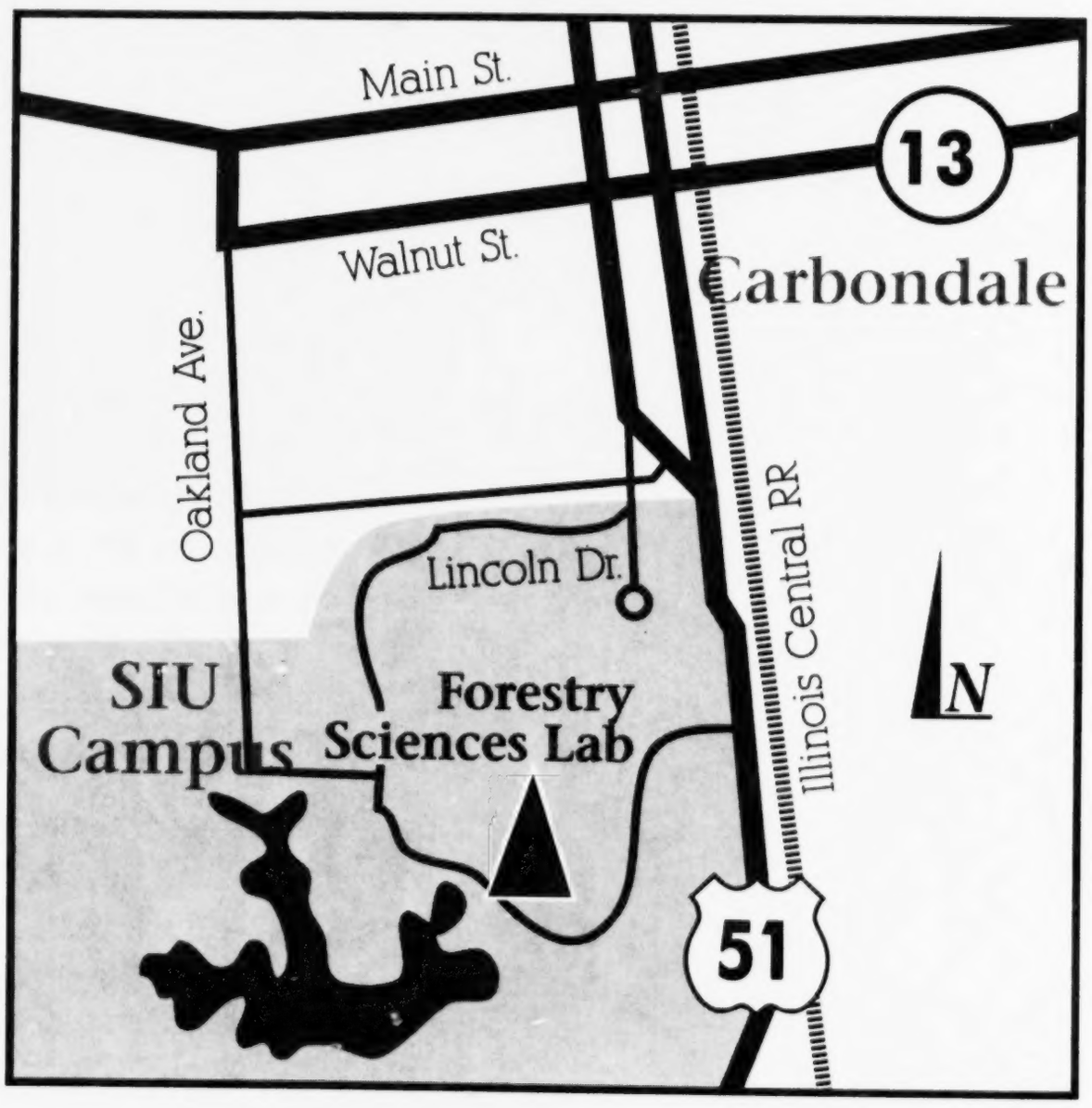
Laboratory scientists and cooperators also conduct studies on the artificial and natural regeneration of hardwood stands using selected trees. Genetic variation in growth and wood properties of various central hardwoods is being characterized and measured. This long-term research involves establishing provenance/progeny tests using seed from sources across the natural range of each species, and then periodically remeasuring trees in existing tests to analyze for changes in genetic variation over an entire rotation.

In the last decade, researchers here, in cooperation with Southern Illinois University-Carbondale, have developed tissue culture techniques to clonally propagate several of the high-value central hardwoods. Micropropagated plantlets are used to test for the presence of toxins produced by other plants commonly found growing in hardwood plantings. The new tissue culture bioassay confirms our earlier results from greenhouse and field studies on allelopathy.

Oaks and hickories in the central hardwood forest are seriously declining in growth and dying of unknown or vaguely defined causes. Our plant pathologist is working to determine if biotic agents are contributing to this decline. Insects, diseases, moisture stress, and environmental pollutants continue to be investigated for their impact on hardwood growth and wood properties, and their association with decline and mortality.

Variation in color and texture contributes to the distinctive nature of wood, but too much variation in these properties creates problems for wood processing and manufacturing firms. Wood technologists in the hardwood processing project study the influence of age, silvicultural practices, environment, and genetics on variation in wood properties. Also, properties such as color, texture, and permeability are being analyzed to learn how they affect quality. Wood permeability is being studied to see if it can be affected by silvicultural practices and physical treatments such as freezing and ultrasonic cavitation. Studies on the relations between soil and site on color and texture are conducted in close cooperation with the fine hardwoods industry.





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